

6200 SOUTH TRAFFIC ANALYSIS

**Prepared for:
City of Taylorsville**

August 31, 2004

**Prepared By:
Korve Engineering
935 E. South Union Avenue, Suite D-203
Midvale, UT 84047
(801) 569-2131
(801) 569-2149 Fax**

Table of Contents

I.	Introduction.....	1
II.	Executive Summary	1
III.	Qualitative Roadway Characteristics	1
IV.	Bicycle and Pedestrian Conditions	2
V.	Traffic Analysis	2
VI.	Queues.....	9
VII.	Accident History	10
VIII.	Steering Committee Suggestions	12
VII.	Conclusions and Recommendations	13

List of Figures

Figure 1	Existing Lane Geometry	3
Figure 2	Cross-Sections.....	4
Figure 3	Existing Traffic Volumes.....	5
Figure 4	Lane Geometry for Four-lane Configuration	7
Figure 5	Lane Geometry for Five-lane Configuration	8
Figure 6	Existing Queues	11

List of Tables

Table 1	LOS Criteria for Signalized Intersections.....	6
Table 2	Existing Level of Service Summary	6
Table 3	Level of Service Summary For Four-lane Cross-Section	9
Table 4	Level of Service Summary For Five-lane Cross-Section	9
Table 5	Accident Severity.....	10
Table 6	Accident Type.....	10
Appendix	Traffic Counts LOS Worksheets	

1. Introduction

This report evaluates traffic conditions along 6200 South between 2700 West and Redwood Road in Taylorsville, Utah. Traffic counts were completed in May 2004 at the 6200 South/2700 West, 6200 South/2200 West, and 6200 South/Redwood Road intersections during the a.m. and p.m. peak hours. Traffic analysis of these intersections was then conducted based on the existing three-lane configuration on 6200 South and theoretical future four- and five-lane cross-sections. The project team met with a Steering Committee twice to gather information regarding their concerns in the area. The Committee was comprised of seven citizens, one City Councilman, and the City Engineer. Each citizen represented different views and geographic locations of the city.

2. Executive Summary

The 6200 South/2700 West and 6200 South/2200 West intersections currently operate at LOS C or better during both peak hours. The 6200 South/Redwood Road intersection operates at LOS E during the a.m. peak hour and LOS F during the p.m. peak. Converting the eastbound lane geometry to triple lefts and a shared through-right lane would improve the intersection to LOS D and E in the a.m. and p.m., respectively. However, this lane modification may result in increased weaving conflicts on Redwood Road and an offset through lane for drivers going through this intersection in the eastbound direction. Re-striping 6200 South to five lanes is expected to improve the LOS at 2700 West and 2200 West to LOS B or better. The 6200 South/Redwood Road intersection would not be improved by converting 6200 South to a four- or five-lane road.

Currently, significant queuing is present at the 6200 South/Redwood Road intersection for the southbound right movement during the p.m. peak hour, the eastbound left turn during both peak hours, and for the westbound movements in the p.m. peak hour. The southbound right movement queuing continues westward on 6200 South about halfway to 2200 West in the p.m. peak hour because this traffic must merge with other vehicles going west. The eastbound direction of 6200 South queues from 2200 West back towards 2700 West in the a.m. peak hour, particularly during the time just prior to school. Some eastbound queuing also occurs in the a.m. peak hour west of 2700 West where the two through lanes must merge into one. Expanding 6200 South to two lanes in each direction would reduce the queuing at 2700 West and 2200 West, but likely increase the queues at Redwood Road.

During the seven-year period from 1996 to 2002, there was an average of 61 accidents per year along 6200 South between 2700 West and Redwood Road, with a maximum of 72 in 2001 and a minimum of 46 in 2002. Nearly 90% of all accidents involved no injury or possible injury. No fatalities were reported in the official statistics provided by UDOT (although there was evidence presented by members of the Steering Committee that suggested otherwise). Approximately 93% of the accidents only involved motor vehicles and about two-thirds were of the rear-end type. About 41% of accidents occurred at signalized intersections and 54% took place where there either was no traffic control or only on-street pavement striping.

3. Qualitative Roadway Characteristics

6200 South, also known as Bennion Boulevard, is a five-lane roadway west of 2700 West and three lanes between 2700 West and Redwood Road. Between 2700 West and Redwood Road there are 63 driveways that have direct access to 6200 South. A total of 11 of the driveways are constructed in a manner which allows a car to turn around in the driveway. Vehicles using the other 52 driveways must either back in or out. The three-lane portion of 6200 South has a 12.5-foot shoulder between the outside lane stripe and curb. Only one vehicle was observed parked

along the three-lane stretch of the road during the peak hours (parking is prohibited west of 2700 West). The lane geometries present at the three study intersections are shown in Figure 1. The southbound direction of Redwood Road has a channelized right turn lane.

Currently, 6200 South is 59 feet wide. Along the three-lane section between 2700 West and Redwood Road, this width is allocated to one 11-foot left turn center lane, two 11.5-foot travel lanes, and two 12.5-foot shoulders. A four-lane cross-section would likely consist of two 12-foot travel lanes in each direction with two 5.5-foot shoulders. A five-lane cross-section would result in an 11-foot left turn center lane, two 11.5-foot inside lanes, and two 12.5-foot outside lanes. The existing 3-lane and potential future 4- and 5-lane cross-sections are shown graphically in Figure 2.

The stretch of 6200 South between 2700 West and Redwood Road consists mainly of single family homes. However, a Junior High School, Elementary School, apartment complex, and two churches are also located along the road. UTA Bus Route 48 travels along 6200 South between Redwood Road and 2700 West. This is an express bus route between West Jordan and Salt Lake City with eastbound trips during the morning peak hour and westbound trips during the p.m. peak. Vehicles and pedestrians along 6200 South at 2700 West, 2200 West, and Redwood Road were counted on May 5 and May 11, 2004 during the a.m. and p.m. peak hours. Existing volumes are illustrated in Figure 3. Detailed traffic count sheets are included in the appendix.

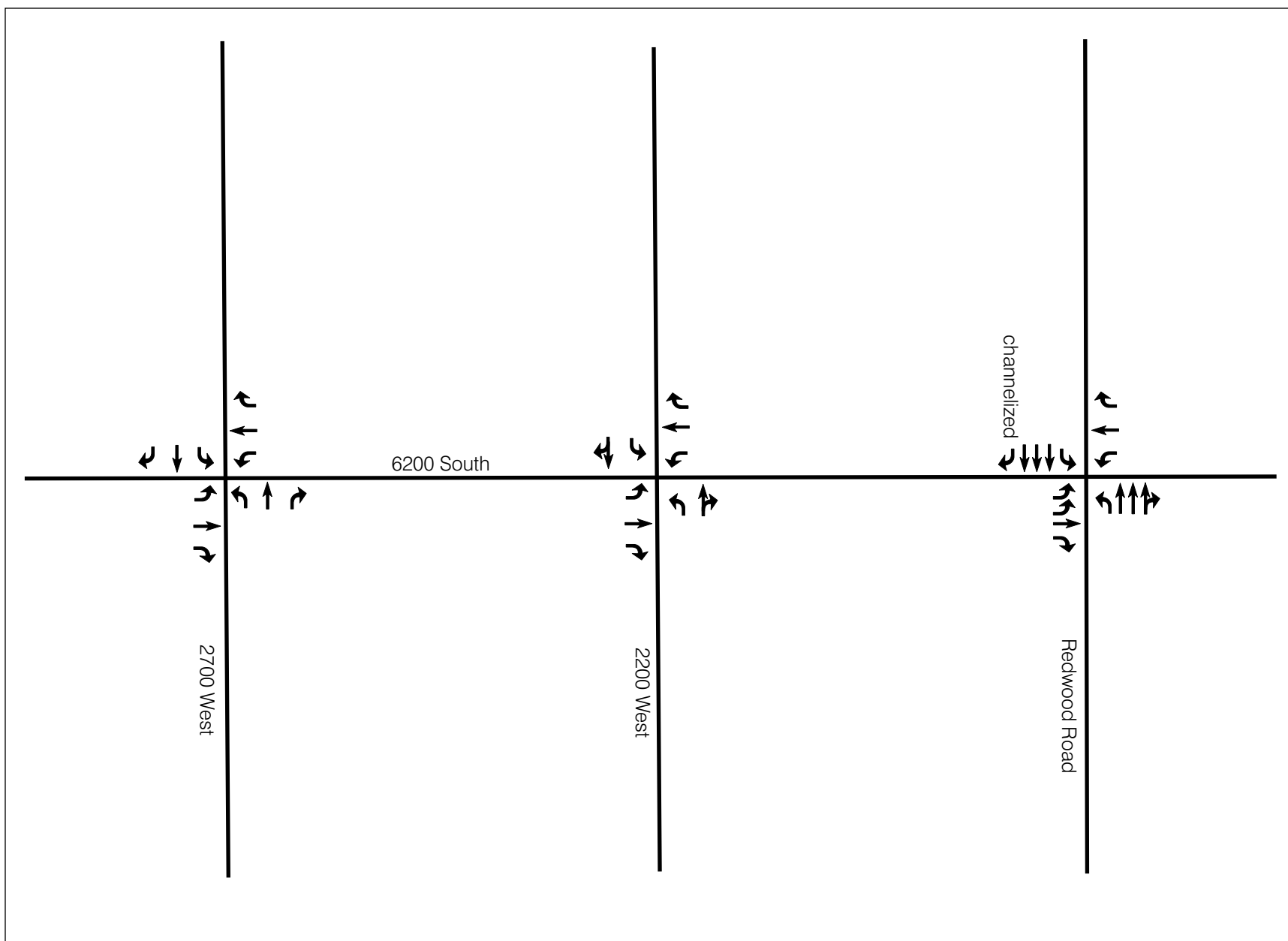
4. Bicycle and Pedestrian Conditions

Sidewalks between Redwood Road and 2700 West are continuous. They are 4 feet wide, except adjacent to the schools where they are ten feet wide. Re-striping of 6200 South will not result in any changes to the physical aspect of the sidewalks. However, adding the extra lanes would bring traffic closer to pedestrians. A four-lane roadway would result in traffic traveling five or six feet away from the curb, while a five-lane road would put traffic right next to the curb face. It cannot be conclusively stated from documented studies that pedestrians would be at greater safety risk with a four- or five-lane roadway; however, bringing 35-40 mph traffic closer to pedestrians would seem to increase the risk.

A few bicyclists were observed using the wide shoulder area of the three-lane portion of 6200 South. Some children on bicycles also crossed 6200 South at the 2700 West and 2200 West crosswalks near the schools. Converting 6200 South to a four-lane roadway (two travel lanes in each direction and no left turn center turn lane) would still allow for five or six feet of shoulder space for cyclists. Expanding 6200 South to five lanes may discourage bicycling and result in more dangerous bicycling conditions because the wide shoulder that currently exists would become a general vehicular lane without sufficient space for a car to pass a cyclist safely. Some cyclists may also shift to using the sidewalk rather than the roadway.

5. Traffic Analysis

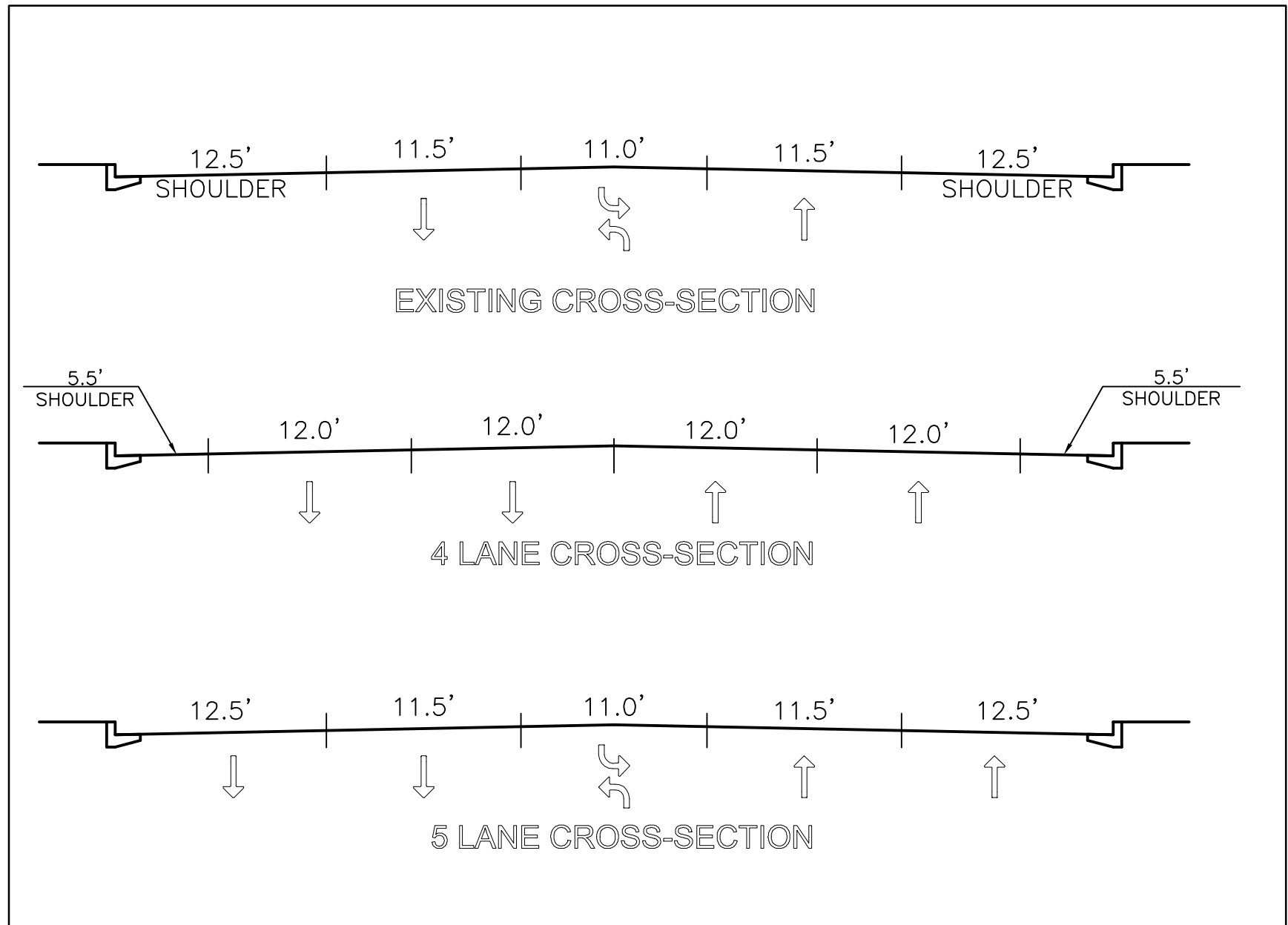
Intersection conditions are described in terms of Level of Service (LOS). The LOS is a measure of an intersection's ability to handle traffic and is based on the delay that motorists experience passing through the intersection. LOS ranges from A to F. LOS A describes conditions with very little delay, LOS C has average traffic delays and LOS F has very long delays and significant traffic congestion. The LOS designation criteria for signalized intersections are presented in Table 1.



6200 SOUTH TRAFFIC STUDY

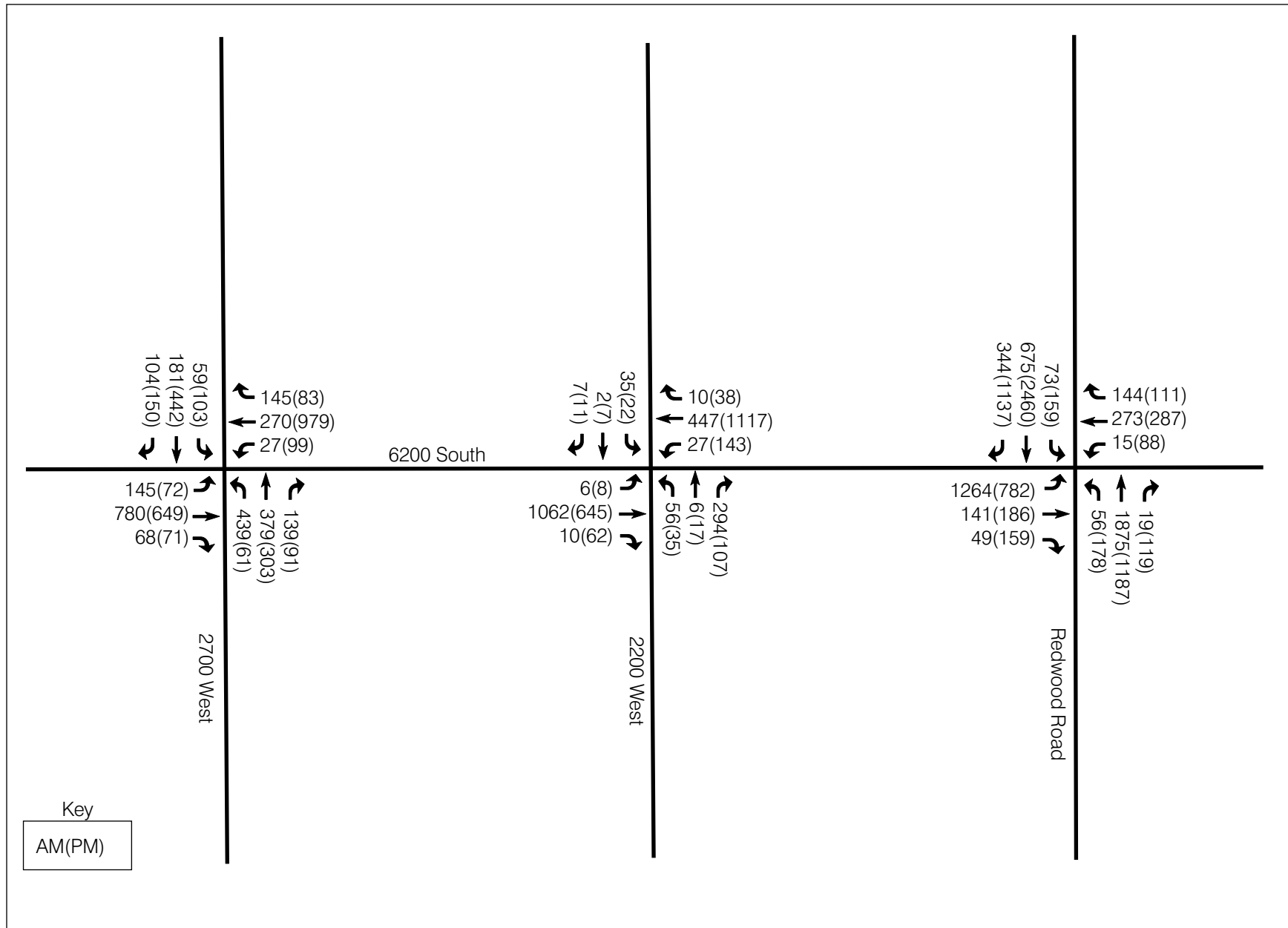
Figure 1

EXISTING LANE GEOMETRY



6200 SOUTH TRAFFIC STUDY

Figure 2
CROSS-SECTIONS



6200 SOUTH TRAFFIC STUDY

Figure 3
EXISTING TRAFFIC VOLUMES

TABLE 1
LOS Criteria for Signalized Intersections

LEVEL OF SERVICE	CONTROL DELAY PER VEHICLE (seconds)
A	< 10
B	> 10 and < 20
C	> 20 and < 35
D	> 35 and < 55
E	> 55 and < 80
F	> 80

Source: *Highway Capacity Manual*, Chapter 16, Exhibit 16-2, Transportation Research Board, Washington, D.C. 2000.

The LOS at the three study intersections was evaluated using Synchro Software. Traffic conditions were analyzed during the a.m. and p.m. peak hour for the following three scenarios:

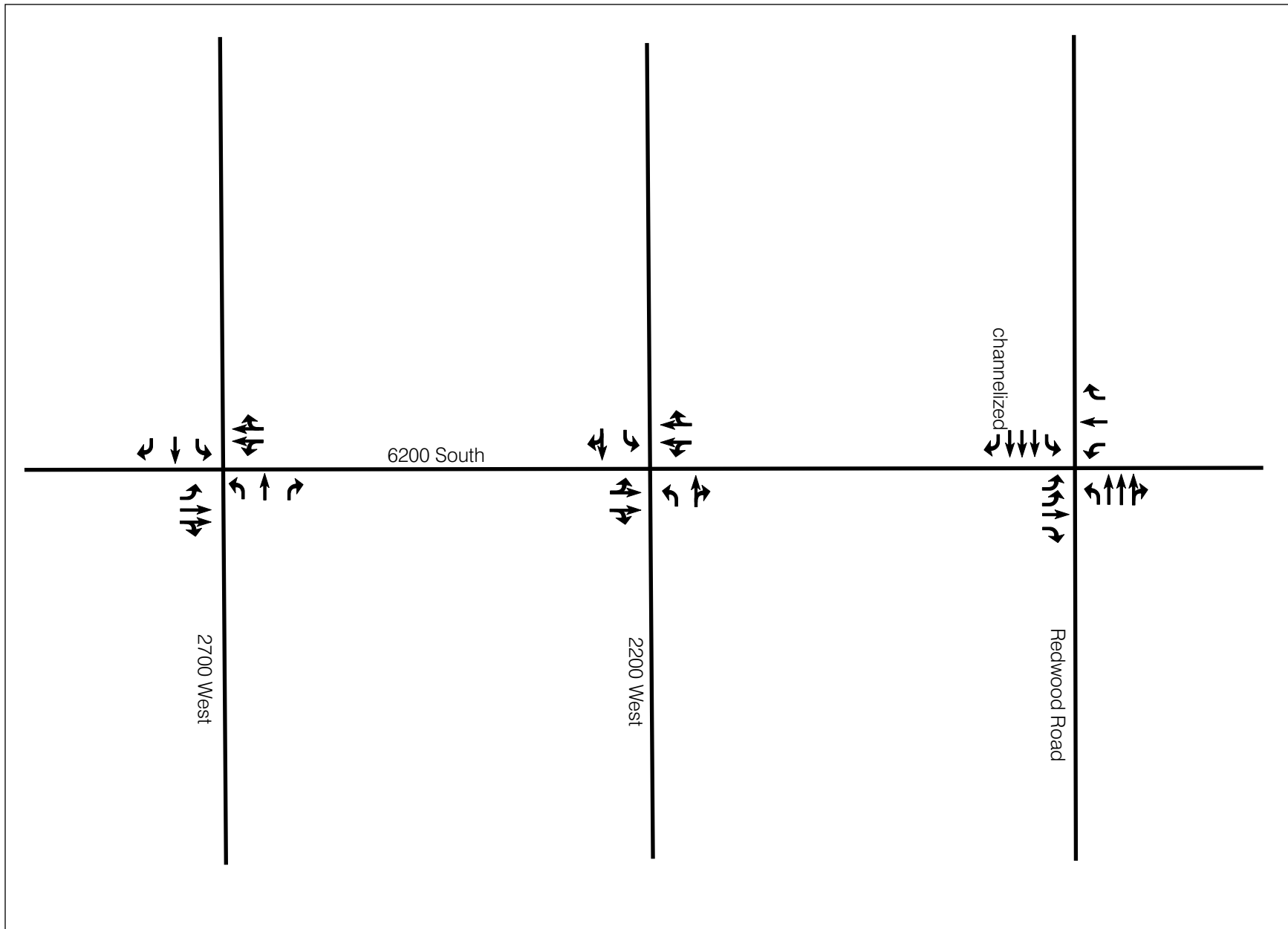
1. Existing three-lane roadway.
2. Four-lane roadway.
3. Five-lane roadway.

The existing intersection geometry and traffic control was used to analyze existing conditions. The lane geometries used to evaluate the four- and five-lane scenarios are shown in Figures 4 and 5, respectively.

The a.m. and p.m. peak period analysis is summarized in Tables 2, 3 and 4 for the existing, four-lane, and five-lane scenarios, respectively. Traffic currently operates at LOS C or better during both the a.m. and p.m. peak hours at the 6200 South/2700 West and 6200 South/2200 West intersections. The 6200 South/Redwood Road intersection operates at LOS F during the a.m. peak hour and LOS E during the p.m. peak.

TABLE 2
Existing Level of Service Summary

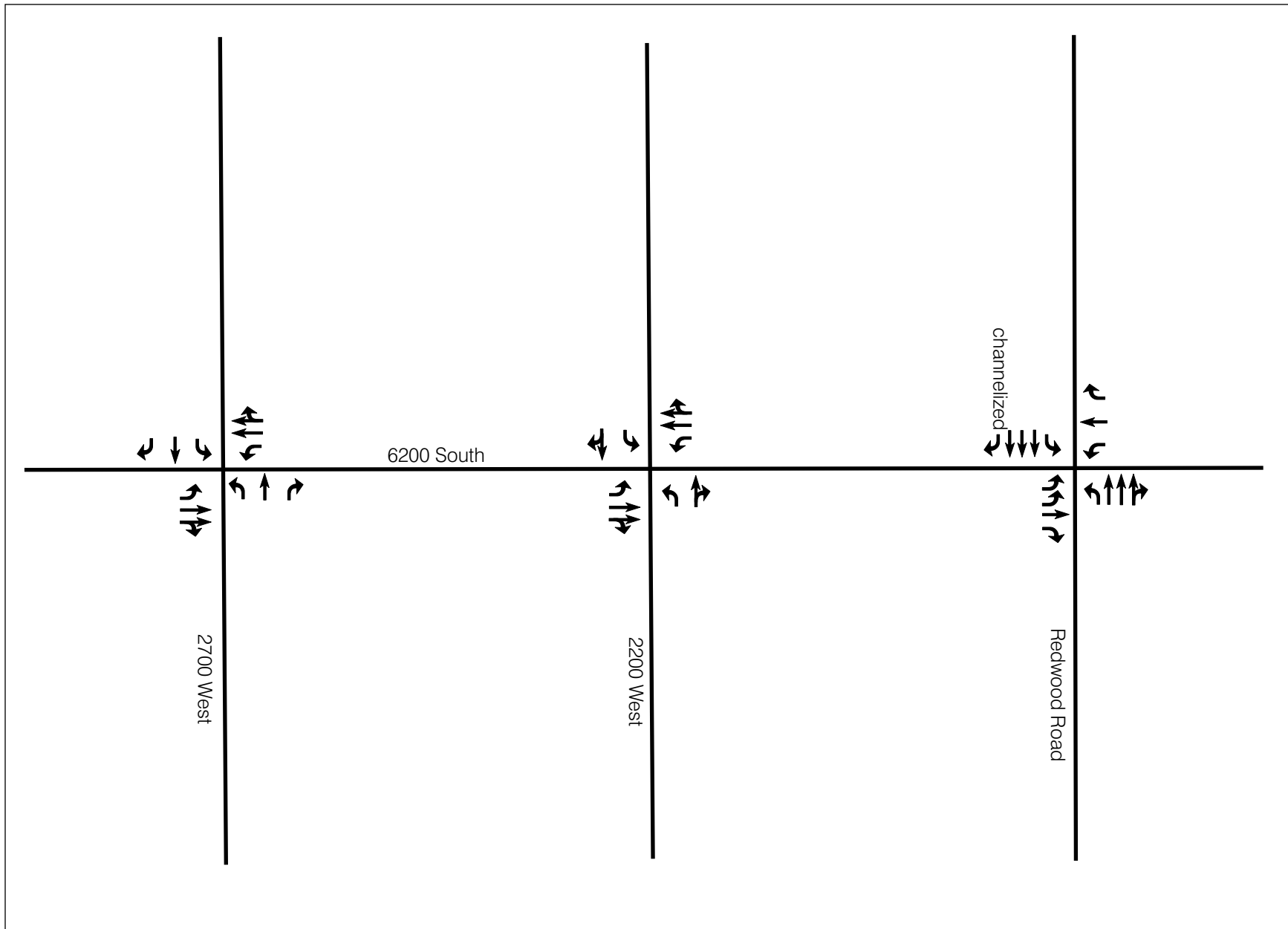
Intersection	Peak Hour	Delay (seconds/vehicle)	LOS
2700 West / 6200 South	AM (7:15-8:15)	13.6	B
	PM (5:00-6:00)	26.7	C
2200 West / 6200 South	AM (7:00-8:00)	26.2	C
	PM (4:30-5:30)	10.6	B
Redwood Road / 6200 South	AM (7:15-8:15)	81.5	F
	PM (4:45-5:45)	77.7	E



6200 SOUTH TRAFFIC STUDY

Figure 4

LANE GEOMETRY FOR FOUR-LANE CONFIGURATION



6200 SOUTH TRAFFIC STUDY

Figure 5

LANE GEOMETRY FOR FIVE-LANE CONFIGURATION

TABLE 3
Level of Service Summary For Four-Lane Cross-Section

Intersection	Peak Hour	Delay (seconds/vehicle)	LOS
2700 West / 6200 South	AM	9.1	A
	PM	16.6	B
2200 West / 6200 South	AM	9.3	A
	PM	7.7	A
Redwood Road / 6200 South	AM	81.5	F
	PM	77.6	E

TABLE 4
Level of Service Summary For Five-Lane Cross-Section

Intersection	Peak Hour	Delay (seconds/vehicle)	LOS
2700 West / 6200 South	AM	9.2	A
	PM	12.6	B
2200 West / 6200 South	AM	9.3	A
	PM	6.1	A
Redwood Road / 6200 South	AM	81.5	F
	PM	77.6	E

Widening 6200 South to four or five lanes would improve the 2700 West and 2200 West intersections to LOS A and B. The 6200 South/Redwood Road intersection would not be improved by the expansion. Detailed LOS calculation sheets are included in the appendix.

6. Queues

Queues at the three study intersections were observed during the peak hours. At the 2700 West and 2200 West intersections, significant queues – defined as one in which all stopped vehicles do not clear the intersection in one cycle length – only occurred for about 20 minutes prior to the beginning of school in the morning. The main queue is eastbound between 2700 West and 2200 West. Traffic experiences a slow moving queue beginning about 2,400 feet west of 2200 South (near the Junior High School track) and does not speed up appreciably until going through 2200 West. Queuing also occurs immediately west of 2700 West in the eastbound direction where the two through lanes must converge to a single lane. No significant queues were observed in the p.m. peak hour at these intersections.

At the 6200 South/Redwood Road intersection, several of the approaches experience significant queuing. In the a.m. peak period, the eastbound left turn lanes back up approximately 1,100 feet west of the intersection (about 100 feet west of the canal crossing). During the p.m. peak hour, this eastbound approach backs up about 1,000 feet, while the westbound approach backs up about 500 feet. It generally takes two or three cycles for an eastbound left turning vehicle to clear this intersection during both peak hours. Westbound vehicles usually take one cycle in the a.m. and one or two cycles during the p.m. peak hour. The channelized southbound right turn movement experiences a slow moving queue that backs up all the way past the I-215 interchange in the p.m. peak hour. The other northbound and southbound movements on Redwood Road are usually able

to clear the intersection in one signal cycle, with the exception of the northbound left turn, which often takes more than one cycle to clear. A graphic of existing queues is shown in Figure 6.

Striping 6200 South to four or five lanes would reduce queuing at 2700 West and 2200 West. Queues would be about 40% smaller since there would be two lanes in each direction for vehicles to stack at intersections rather than one. The free southbound right turn movement at Redwood Road currently must merge in with the main flow of 6200 South west of the intersection. A five-lane road would allow for southbound right turns to have an exclusive lane and thus would reduce spillback queuing on Redwood Road. Re-striping 6200 South with two through lanes in each direction would likely increase the queuing on the eastbound left movement from 6200 South to Redwood Road because upstream vehicles would reach the intersection faster.

7. Accident History

Between 1996 and 2002, there was an average of 61 accidents per year on 6200 South between 2700 West and Redwood Road, with a maximum of 72 in 2001 and a minimum of 46 in 2002. Two accident characteristics are documented in this section: (1) accident severity and (2) accident type. Accident severity relates to the extent of bodily injury suffered and accident type refers to the type of vehicle(s) involved (e.g. motor vehicle, bicycle, pedestrian, etc).

More than two-thirds of all accidents reported along 6200 South between 1996 and 2002 did not result in any injury. About 25% resulted in “possible injury”, while the remaining 11% involved injuries ranging from bruises to broken bones and bleeding wounds. No fatalities were reported. Table 4 summarizes the accident severity information for each of the seven years of data.

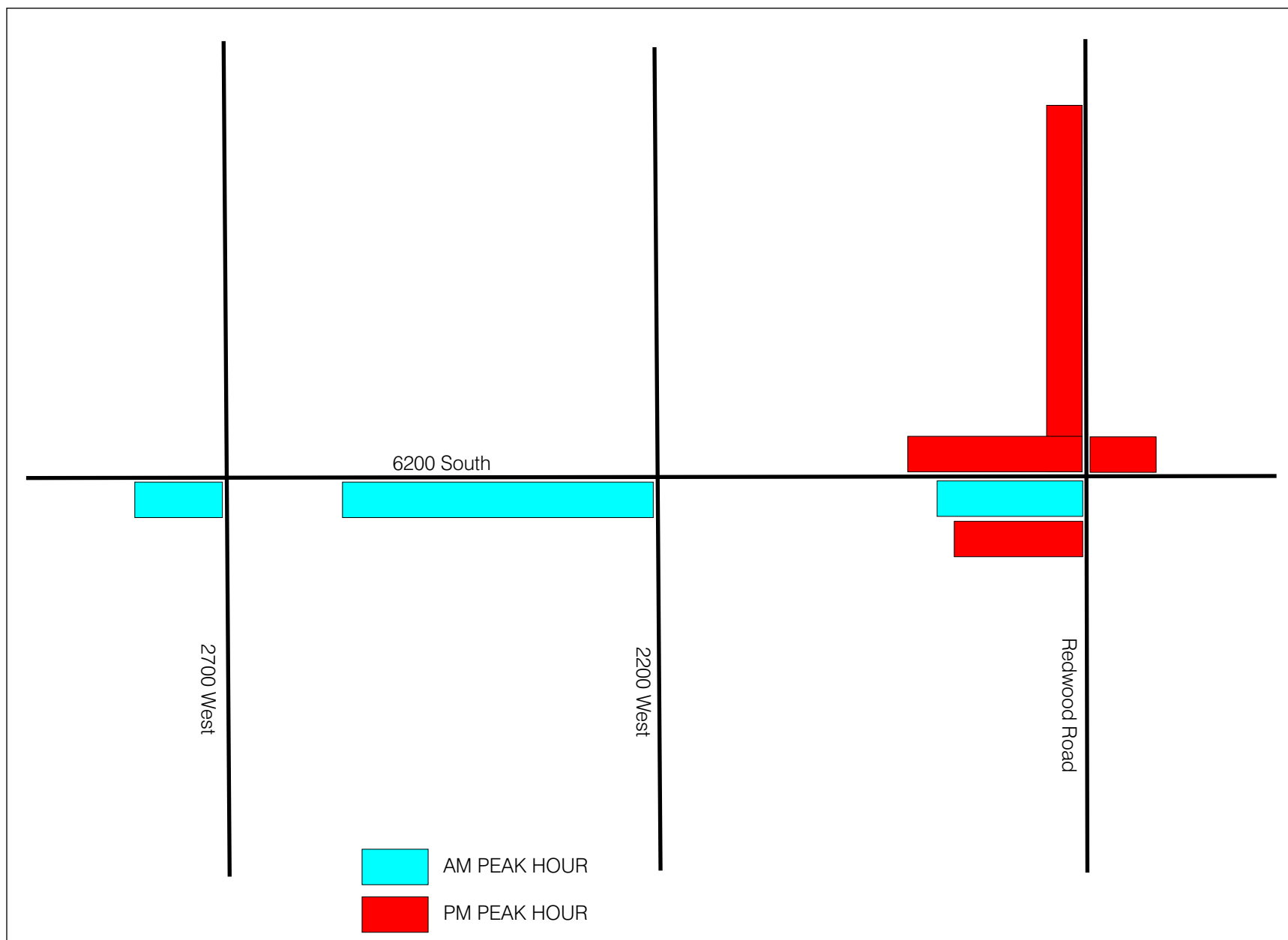
TABLE 5
Accident Severity

Severity Type	1996	1997	1998	1999	2000	2001	2002	Average
No Injury	57.9%	53.0%	60.3%	73.2%	71.0%	58.3%	73.9%	64.0%
Possible Injury	21.1%	33.3%	29.3%	17.9%	23.2%	29.2%	21.7%	25.1%
Bruises/ Abrasions	14.0%	7.6%	6.9%	3.6%	4.3%	6.9%	4.3%	6.8%
Broken Bones/Bleeding	7.0%	6.1%	3.4%	5.4%	1.4%	5.6%	0.0%	4.1%

Table 5 summarizes information regarding accident type. More than 90% of all collisions involved two or more motor vehicles. Various other types of accidents make up the remainder, with “ran off road to the right”, “motor vehicle-fixed object”, and “motor vehicle-bicycle” crashes being the most common. Only two reported accidents involved pedestrians, although several members of the Steering Committee stated that there had been fatalities involving pedestrians.

TABLE 6
Accident Type

Type	1996	1997	1998	1999	2000	2001	2002	Average
Motor Vehicle-Motor Vehicle	91.2%	90.9%	91.4%	98.2%	91.3%	93.1%	91.3%	92.5%
Ran Off Road-Right	5.3%	0.0%	3.4%	1.8%	0.0%	1.4%	2.2%	1.9%
Motor Vehicle-Fixed Object	1.8%	0.0%	0.0%	0.0%	2.9%	1.4%	4.3%	1.4%
Motor Vehicle-Bicycle	1.8%	4.5%	1.7%	0.0%	1.4%	0.0%	0.0%	1.4%
Ran Off Road-Left	0.0%	1.5%	1.7%	0.0%	1.4%	1.4%	2.2%	1.2%
Other Non-Collision	0.0%	0.0%	1.7%	0.0%	2.9%	1.4%	0.0%	0.9%
Motor Vehicle-Pedestrian	0.0%	3.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.5%
Motor Vehicle-Other Object	0.0%	0.0%	0.0%	0.0%	0.0%	1.4%	0.0%	0.2%



6200 SOUTH TRAFFIC STUDY

Figure 6
EXISTING QUEUES

8. Steering Committee Suggestions

Several suggestions were made during the initial Steering Committee meeting. These suggestions were investigated to find out to what extent they could be incorporated into improvements along the 6200 South corridor. Each suggestion is described below along with a corresponding evaluation.

- **Closure of Side Streets** – Residents that live on most of the side streets already have the option of going to either 2200 West or 2700 West to make left turns instead of using a stop-controlled street to access 6200 South. It is likely that many of these people are already doing this during times when 6200 South is congested. Very little (or no) improvement would be gained on 6200 South by closing the side streets. Also, more direct access would be precluded during non-peak times when left turns can be made without too much difficulty, which would result in more circuitous travel for residents and visitors to reach their homes.
- **Reversible Lane** – In order to create a reversible lane, electronic messaging signs would need to be installed above the lane from Redwood Road to 2700 West. Left turn access to side streets and residential driveways would probably need to be prohibited. Such a lane would reduce queuing near 2200 West and 2700 West. The Redwood/6200 South queuing would probably increase. A reversible lane would be more expensive than a 4- or 5-lane alternative with no significant advantages, so it was not evaluated further.
- **Retiming of 2200 West signal during AM Peak** – When the traffic counts were completed, the signal at 2200 West had a cycle length of about 60 seconds during the AM peak hour, with 40 seconds given to 6200 South and 20 seconds to 2200 West. This resulted in queuing in the eastbound direction of 6200 South. The eastbound queue could be reduced somewhat by increasing the cycle length and allocating the extra time to 6200 South. Pedestrians cross the road in small enough numbers at a given time during the AM peak such that an extra wait of 10 or 20 seconds should not cause significant crowding on the street corner. The cycle length is much longer during the time when the elementary school is dismissed in the afternoon. This long cycle length results in very large groups of students waiting to cross 6200 South at 2200 West. The City will work with Salt Lake County to optimize the signal timing at 2200 West and 2700 West.
- **Re-striping of westbound approach at the Redwood/6200 South intersection** – Several alternatives were suggested, including (1) converting the through lane to a left/through lane along with a left turn lane and right turn lane and (2) installing dual right turn lanes with a shared left/through lane. Neither one of these alternatives was shown in the analysis to improve conditions; in fact, conditions were made slightly worse in each case. It appears that the current lane striping is best.

9. Conclusions and Recommendations

There are three options available with regard to the lane striping along 6200 South between 2700 West and Redwood Road: (1) leave it as a three-lane section with an 11-foot left turn center lane, two 11.5-foot lanes, and two 12.5-foot shoulders, (2) re-stripe the roadway with two 12-foot lanes in each direction and two 5.5-foot shoulders, and (3) re-stripe the roadway with an 11-foot left turn center lane, two 11.5-foot inside lanes, and two 12.5-foot outside lanes. Each of these scenarios has advantages and disadvantages, which are listed below beneath each scenario.

Option 1: Leave 6200 In Its Current State

The main advantage of this scenario is that residents would still be able to back out of their driveways with the help of the 12.5-foot shoulder. Another advantage is that no time or labor would be involved. The main disadvantage is that all of the existing queues (along 6200 South at 2700 West, 2200 West, and at the location where southbound right turning traffic from Redwood Road merges into 6200 South) would remain in their current state and possibly get worse in the future.

Option 2: Re-Stripe As a 4-Lane Roadway

Striping 6200 South as a 4-lane road would reduce queuing at 2700 West, 2200 West, and the merge from Redwood onto 6200 South. It would also still leave a 5.5-foot shoulder space to serve as a shoulder for bicyclists and a buffer for pedestrians. It would not, however, provide sufficient space to allow for vehicles to back out of residential driveways comfortably and safely. Another downside to this alternative is that the lack of a left turn center lane could lead to more accidents and queuing as vehicles stop in the inside traffic lane to find gaps for left turns. Also, residents trying to make left turns onto 6200 South from side streets would have a more difficult time in the absence of a left turn center lane.

Option 3: Re-Stripe As a 5-Lane Roadway

Striping 6200 South as a 5-lane road would reduce queuing at 2700 West, 2200 West, and the merge from Redwood onto 6200 South. A left turn center lane would be provided to remove left turning vehicles from the through lanes. Side street access would be easier than Options 1 and 2 because more gaps would be available and a left turn center lane would be provided. There are several disadvantages to this scenario, however. Residents would not have any space to back out into the street. Also, sufficient room would not exist for a vehicle to safely pass a cyclist because of the non-existent shoulder and vehicles would be traveling next to the sidewalk.

Re-striping 6200 South as a four- or five-lane roadway will yield some small time savings (about 20-30 seconds) in the p.m. peak hour because it will eliminate the merging problems experienced in the westbound direction between Redwood Road and 2200 West. Re-striping will not, however, significantly improve travel time in the eastbound direction for either peak hour because it will not increase capacity at the 6200 South/Redwood Road intersection. Since it takes two or three cycle lengths to get through the eastbound left turn movement at Redwood Road (80% of eastbound traffic turns left), re-striping will get eastbound vehicles to the queue faster but will not do anything to solve the root problem, which is the congestion at Redwood Road. Since re-striping would inconvenience residents along 6200 South and possibly increase safety concerns for both drivers and pedestrians, we recommend that 6200 South not be re-striped to four or five lanes until capacity concerns at Redwood Road are addressed.